

ABSTRACT OF THE DISCLOSURE

A medical system includes a carrier and a multiplicity of electromechanical transducers mounted to the carrier, the transducers being disposable in effective pressure-wave-transmitting contact with a patient. Energization componentry is operatively connected to a first plurality of the transducers for supplying the same with electrical signals of at least one pre-established ultrasonic frequency to produce first pressure waves in the patient. A control unit is operatively connected to the energization componentry and includes an electronic analyzer operatively connected to a second plurality of the transducers for performing electronic 3D volumetric data acquisition and imaging (which includes determining three-dimensional shapes) of internal tissue structures of the patient by analyzing signals generated by the second plurality of the transducers in response to second pressure waves produced at the internal tissue structures in response to the first pressure waves. The control unit includes phased-array signal processing circuitry for effectuating an electronic scanning of the internal tissue structures which facilitates one-dimensional (vector), 2D (planar), and 3D (volume) data acquisition. The control unit further includes circuitry for defining multiple data gathering apertures and for coherently combining structural data from the respective apertures to increase spatial resolution. When the data gathering apertures are contained in a flexible web or carrier so that the instantaneous positions of the data gathering apertures are unknown, a self-cohering algorithm is used to determine their positions so that coherent aperture combining can be performed.